

Hypertherm

Location: Hanover, New Hampshire

Occupation of apprentice: CNC machine operator

Company Web Address: <https://www.hypertherm.com/en-US/>

Background³⁷

Hypertherm is a Hanover, New Hampshire, based manufacturer of plasma, laser, and waterjet cutting systems. In partnership with Vermont HITEC, a non-profit workforce development organization, Hypertherm first began training CNC machinist apprentices in 2005 under a two-year program.³⁸ In 2007, the company established the Hypertherm Technical Training Institute (HTTI) as a first step in adopting the apprenticeship program created by Vermont HITEC. Vermont HITEC's training model emphasizes a short, intensive period of classroom training to get new (and sometimes incumbent) employees more skilled and productive quickly, followed by OJT at an employer.

Motivation

Hanover, along with the surrounding cities in New Hampshire and Vermont, was part of the region known as "Precision Valley" in the 1970s because of its booming machine tool manufacturing industry. In the 1980s, the industry began a decades-long decline and many precision manufacturing jobs left the area. Over time, and paralleling much of the rest of the country, many people in the area began to see manufacturing jobs as unattractive and as a dead end.

In 2005, management at Hypertherm estimated that the company would need to hire approximately 60 machine operators each year through 2009. At the time, the company only employed around 120 machine operators; increasing its workforce by 50 percent per year represented a sizeable expansion, and the local labor market was unable to supply enough recent graduates or experienced workers. The local community colleges and technical school graduated one or two qualified CNC machinists each year. The relatively remote location of the firm coupled with lack of skilled new entrants to the labor market led Hypertherm to apprenticeship.

In order to hire a substantial number of new machine operators, Hypertherm turned to Vermont HITEC for help. For several years, Vermont HITEC had been running a multi-employer program to provide technical training for CNC machinists in an intensive nine-week classroom session, at which point apprentices would join sponsoring firms for OJT. In 2005, rather than share sponsorship with other employers, Hypertherm decided to sponsor an entire class of 16 students, followed by a second class of 14 students.

Two years later, with the development of the \$2-million HTTI, Hypertherm brought the Vermont HITEC program onsite. HTTI's in-house lab is structured as a "room within a room," with employees receiving training in a classroom embedded within the shop floor. The lab is equipped with CNC machines to train employees in a non-production environment. Many of the machines are identical to ones that apprentices will use in production after their training; others are different but still allow for learning the processes on

³⁷ For more information about Hypertherm's apprenticeship program, see: <https://www.hypertherm.com/en-US/our-company/careers/career-areas/manufacturing/machine-operator-training/>.

³⁸ See Vermont HITEC case study for more information.

which Hypertherm relies. Additionally, the firm relies on a system called 5S lean manufacturing.³⁹ From the beginning, Hypertherm tries to instill the 5S principles in their workforce to keep them focused on efficient production with minimal waste. For example, at Hypertherm, every object has a designated storage space to which it must be returned after use, even including the salt and pepper shakers in the break room. The 5S principles are embedded in Hypertherm's corporate culture.

Recruiting

Initially, Vermont HITEC handled recruiting for the program. Radio and newspaper ads, press releases, the Vermont and New Hampshire Departments of Labor, ads on stubs for unemployment insurance checks, community organizations, and even flyers in the supermarket were used as a full-court press to find candidates for the Hypertherm apprenticeship. All of the ads emphasized that previous experience was not required, with a high school diploma or GED the only prerequisite. Hypertherm has since partnered with River Valley Community College to take over these duties.

Hypertherm screens candidates using a three-stage process. In the first stage, applicants learn about work in a machine shop, take tours of the floor, participate in a short interview, and take basic math and behavioral screenings. Hypertherm uses the second phase to assess cultural fit; production leadership interviews candidates and assesses their interest level, past technical experience, and motivation to take on new work. Finally, candidates participate in a classroom simulation with short lectures and quizzes. This phase is used less to judge candidates' performance than as a measure of how well candidates can represent themselves in a classroom environment where motivation and self-learning are key to success. In all, Hypertherm receives about 150 applicants for each class of apprentices, ultimately selecting up to 16 for each class.

After realizing that apprentices were performing better than veteran workers, Hypertherm began using its apprenticeship program to re-train the existing workforce. This contrasts significantly with other companies in this study, which rely on apprentices to fill some, but not usually all, positions for which they have apprenticeships. Currently, all but 10 Hypertherm machinists have been through the apprenticeship program.

Program Details

Hypertherm's two-year apprenticeship begins with nine weeks of intensive technical classroom and hands-on training. During this training, apprentices learn about lean manufacturing (which reduces waste in a manufacturing system) and the machining process. They learn how to read drawings and how to inspect and retool machines. The training puts all the concepts that apprentices need to know together from day one, rather than teaching one concept at a time.

Upon completion of the nine-week classroom and hands-on program at HTTI, apprentices receive an academic CNC machinist certificate from River Valley Community College and a pay increase. Apprentices then move to the shop floor to work under a mentor. This OJT portion of the apprenticeship lasts approximately two years, though Hypertherm uses a competency-based model that allows some apprentices to finish earlier if they are able to demonstrate that they have acquired the required skills. At the end of the program, apprentices receive a CNC machinist certificate from DOL. HTTI also offers two additional training programs for current Hypertherm employees beyond the basic CNC machinist program—a more senior machinist as well as production support technician—that employees are encouraged to complete if they are interested.

³⁹ 5S is a workplace organization method that originated in Japanese manufacturing. In Japanese, the five steps of the process are: seiri, seiton, seiso, seiketsu, and shitsuke. One English translation of these steps is: sort, straighten, shine, standardize, sustain. For more information, see <https://us.kaizen.com/knowledge-center/what-is-5s.html>.

Costs and Benefits

Hypertherm estimates that costs for the nine-week training program are about \$9,000 per apprentice. Additionally, mentors work with apprentices, but because mentors are still producing, Hypertherm does not explicitly quantify the costs of their labor hours for the apprenticeship program. Prior to the establishment of HTTI, apprentices were not paid until joining their home firm after the nine-week Vermont HITEC program. With the creation of HTTI, Hypertherm now pays all of its apprentices starting from the first day of their apprenticeship. Hypertherm believes that paying apprentices during the nine-week training builds employees loyalty. Additionally, it is an incentive to keep the training short and rigorous, which allows Hypertherm to get apprentices onto the production floor as quickly as possible. At the conclusion of the classroom training, apprentices receive a raise of \$1 per hour to \$14.50 per hour; they receive another raise when promoted to a second-level machine operator four months to a year later, based on the speed at which they master competencies.

Hypertherm's \$2 million investment in capital equipment to establish HTTI was a relatively large upfront cost compared to some of the other firms in the study. However, the company calculates that the program has more than paid for itself in productivity gains through reduced downtime and maintenance costs. Prior to training apprentices in the lab, new employees required approximately one year of training to get to the performance level that they now reach in nine weeks. During that first year, the new hires shadowed other employees, producing very little of their own work and potentially reducing the productivity of shadowed employees. Hypertherm estimates that reducing training time from one year to nine weeks has saved the company \$680,000 per year (based on an average of three classes, or 45 apprentices, per year).

Beyond the reduction in training time is the savings that Hypertherm has seen from reduced downtime and reduced maintenance costs. Hypertherm runs three operational shifts. As with many factories, the first shift—or the day shift, typically lasting from around 8:00 a.m. until 5:00 p.m.—is the largest shift and is when the vast majority of technical support personnel were available prior to the program. If problems or errors occurred during the “ghost” second or third shifts, workers would often have to wait until the next day's first shift for the problem to be resolved. During the downtime, Hypertherm was paying employees to wait idly. In 2006, Hypertherm had an average of six to eight machine crashes per week, with repairs ranging from \$10 to \$40,000. The time to get the machines up and running again ranged from 15 minutes to two weeks. By reducing the number of machine crashes, Hypertherm estimates that it has recovered \$300,000 per year in production time. Additionally, the company estimates it has avoided approximately \$50,000 annually in repair costs. Lastly, technicians are responsible for trying to self-diagnose machine errors for 30 minutes prior to submitting a request for assistance. By decreasing the number of these requests and the associated downtime, Hypertherm estimates that it has saved \$560,000 per year.

Together, Hypertherm estimates that reduced training time and increased work quality save nearly \$1.6 million dollars per year relative to its prior training methods. Such savings quickly offset the \$2 million investment to create the HTTI.